Times Standard

Not My Fault: Iceland – of eruptions, ash, and mega-floods

Lori Dengler for the Times-Standard

Posted August 5, 2023
https://www.times-standard.com/2023/08/05/lori-dengler-iceland-of-eruptions-ash-and-mega-floods/

The 2010 eruption of Eyjafjallajökull taken from Hvolsvöllur on April 17th, 2010 (Wikipedia Commons).

Iceland has more volcanoes per unit area than any other country. According to NOAA's volcano database, there is one volcano for every 925 square miles in Iceland. Volcanoes in Indonesia, arguably the most volcanically vulnerable country in the world, are nearly six times less dense.

Excepting Greenland/Denmark, more of Iceland's surface is covered by glaciers than any other country. Vatnajökull glacier is the largest in Europe and covers eight percent of Iceland's surface. Adding in the other 268 glaciers in the country, just about 11% of Iceland's surface area is glacially capped.

The highest elevation areas are where glaciers are most likely to be perched. They are high because volcanism has built them up. Vatnajökull covers seven active volcanoes and all of Iceland's larger volcanoes are ice capped. Eruptions beneath ice are inevitable.

Iceland is a small country and very remote. Of course, geologists are interested in this unique landscape shaped by fire and ice, but why should you be? Remember April 2010? A volcano with an unpronounceable name held transatlantic aviation hostage for five days as ash rained down on much of Europe.

Eyjafjallajökull is a stratovolcano (a volcano composed of both lava flows and ashy layers) near the south coast of Iceland. The summit is covered by a 30-square mile ice cap that feeds many glaciers that flow down the volcano's flanks. It's hard to see the volcano as the terrain is rough, but we were able to visit Gígjökull, one of the two glacier outlets of Eyjafjallajökull. Before the 2010 eruption, the glacier extended more than a mile down the from ice cap. Afterwards, it had lost most of its tongue, broken off by the rush of melt waters.

The 2010 eruption was no surprise to volcanologists and scientists at the Icelandic Meteorological Office, the country's chief scientific agency. Eyjafjallajökull had erupted three times since human settlement in the tenth century and geologic evidence shows at least 12 eruption cycles in the prehistoric past.

Volcanoes almost always give clues before erupting. As magma moves upward it produces small earthquakes, ground deformation, and gas. Seismographs and other monitoring equipment cover the island nation and detected an uptick in activity beneath the volcano five months before small fissures opened in March, triggering authorities to issue evacuation orders for the farming families living in the area.

The main course was served in mid-April in a series of explosive eruptions that reached 26,000 feet. The explosions were driven both by gasses violently escaping the magma and melting glacial ice that quickly flashed to steam. It was directed south by the prevailing winds towards European air space. Volcanic ash and airplanes don't make a good mix. The fine particulate can quickly disable jet engines. In 1989, a commercial jet on approach to Anchorage, Alaska lost all four engines due to the nearby eruption of Mt. Redoubt. Fortunately, the crew were able to restart two of the engines and land safely.

The '89 incident inaugurated Volcanic Ash Advisory Centers to provide real time information on ash hazards to the aviation industry. There are currently nine centers around the globe, each focusing on a particular geographic regions. Part of the safety protocol for all commercial flights is to check the ash potential on the flight path.

In 2010, it was the London-based center that provided ash and weather forecasts to European airspace and by the second day of the eruption, flights were cancelled. Over the next eight days, over 100,000 flights were canceled, costing the airline industry $1.7 billion (US $) and $5 billion in indirect losses. It was the largest disruption to European air travel since World War II.

The effects of the eruption in Iceland were relatively modest. There were no deaths; residents in the southern part of the Island near the volcano reported more respiratory distress symptoms than populations further away. The sprinkling of ash on farmland had no long-term impacts. The ash plume was not high enough to reach the stratosphere, where it might have remained suspended for years, and had no effect on climate.

A big concern in 2010 was flooding. Volcanoes erupting beneath icecaps or glaciers have the potential to melt vast quantities of water and create mega-floods. We use the Icelandic term jökulhlaup as they occur more frequently in Iceland than in any other part of today's world. These glacial outburst floods occur when geothermal activity or eruptions melt vast quantities of water that pool up beneath the ice producing a large hidden lake. If the lake becomes large enough, sudden outbursts of water can occur.

Jökulhlaups have produced some of the greatest flood discharges ever recorded. The peak flow during the Christmas floods of 1964 in Northern California was just over 21,000 cubic meters per second. The largest Icelandic post glacial floods have reached values nearly 20 times as high. The 2010 eruption did produce a jökulhlaup but with peak flows of only 3,000 cubic meters per second, modest compared to past eruptions.

Fortunately, the 2010 eruption produced no lasting impacts, although many people have Eyjafjallajökull stories. My daughter and a roommate were home for a week's spring vacation from their undergraduate studies in London. That week stretched into two. Arcata High's Madrigal Choir were stranded in Italy on a performance trip likewise lasted twice as long.

Eyjafjallajökull has slid back into dormancy. One of the characteristics of stratovolcanoes is their unpredictability. Past eruptions have been both larger and smaller. Some analysts suggested that had the 2010 eruption been as long lasting as those in the 1820s, air travel could have been disrupted for six months.

It's unclear how the 2010 eruption may have affected the neighboring behemoths of Katla and Hekla. Eyjafjallajökull is only 15 miles away from Katla and Hekla, both of which have produced larger eruptions in the past. Some volcanologists have suggested linkages and that eruptions in one may affect the other.

The eruptive gas plume I saw three weeks ago, and the small eruption on the Reykjanes Peninsula is about 90 miles west of Eyjafjallajökull and not related. It shows no signs of affecting air traffic or becoming a major hazard. But one thing I have learned about Iceland is there is no such thing as volcanic quiescence and the next major eruption is always just around the corner.

Note: Try your hand at pronouncing Eyjafjallajökull,
https://forvo.com/word/eyjafjallaj%C3%B6kull/

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times--Standard's. Leave a message at (707) 826-6019 or email Kamome@humboldt.edu for questions and comments about this column. Downloadable copies of the North Coast preparedness magazine "Living on Shaky Ground" are posted at https://rctwg.humboldt.edu/prepare/shaky-ground.